DRAFT FOR PUBLIC REVIEW

Soil Vapor Results for the Winter Sampling for Building K-1225 at the East Tennessee Technology Park, Oak Ridge, Tennessee

This document is approved for public release per review by:

Derek S. Holt — 3/9/2004

BJC ETTP Classification and Information Control Office — **Date**

SCIENCE APPLICATIONS INTERNATIONAL CORPORATION

contributed to the preparation of this document and should not be considered an eligible contractor for its review.

Soil Vapor Results for the Winter Sampling for Building K-1225 at the East Tennessee Technology Park, Oak Ridge, Tennessee

Date Issued—March 2004

Prepared by
Science Applications International Corporation
Oak Ridge, Tennessee
under subcontract 23900-BA-PR007U
under work release 000400

Prepared for the
U. S. Department of Energy
Assets Utilization

BECHTEL JACOBS COMPANY LLC
managing the
Environmental Management Activities at the
East Tennessee Technology Park
Oak Ridge Y-12 Plant Oak Ridge National Laboratory
Paducah Gaseous Diffusion Plant Portsmouth Gaseous Diffusion Plant
under contract DE-AC05-98OR22700
for the
U. S. DEPARTMENT OF ENERGY

04-044(doc)/030804

CONTENTS

blank page

TABLE

blank page

ACRONYMS

DOE	U. S. Department of Energy
EBS	Environmental Baseline Survey
EPA	U. S. Environmental Protection Agency
ETTP	East Tennessee Technology Park
VOC	volatile organic compound

blank page

1. INTRODUCTION

Due to the occurrence of volatile organic compounds (VOCs) in shallow groundwater at the East Tennessee Technology Park (ETTP), the U. S. Environmental Protection Agency (EPA) Region 4 recommended investigation of the vapor intrusion pathway for ETTP facilities that are targeted for transfer to the Community Reuse Organization of East Tennessee or other qualified parties. EPA's recommendation is based upon their *Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils (Draft Vapor Intrusion Guidance)*, EPA530-F-052, from November 2002 (EPA 2002).

In accordance with EPA 2002, and through consultation with representatives from EPA Region 4, the U. S. Department of Energy (DOE) Oak Ridge Operations Office has developed a process to evaluate the potential for vapor intrusion at existing ETTP facilities to be transferred to the private sector under a Comprehensive Environmental Response, Compensation, and Liability Act of 1980 Sect. 120(h) Covenant Deferral Request. The process is described in Sect. 4.4 of the Environmental Baseline Survey (EBS) documents that were prepared for each of the five office buildings proposed for near-term transfer. The EBS documents may be obtained from the DOE Information Center at 475 Oak Ridge Turnpike, Oak Ridge, Tennessee 37830 (865-241-4780), or from the DOE Public Information web site at http://www.oakridge.doe.gov/info_cntr.

The five office buildings designated as K-1007, K-1225, K-1330, K-1400, and K-1580 are the first group proposed for transfer. Two of these buildings (i.e., K-1400 and K-1225) are located within 100 ft of a VOC-contaminated groundwater plume, while the other three (K-1007, K-1330, and K-1580) are not in close proximity (more than 100 ft away) and generally are down- or side-gradient from a plume.

2. SOIL VAPOR RESULTS FOR THE WINTER SAMPLING FOR BUILDING K-1225

The results of the sampling conducted in the winter months in Bldg. K-1225 are presented below. Sub-slab soil vapor was collected on January 15, 2004, to determine if a potential source for VOCs exists under the building. The results were validated and the average concentration for each VOC was calculated and compared to its respective soil vapor trigger level (a level deemed to be health protective).

Based on the results of the winter sampling, no VOC exceeded its respective trigger level (see Table 1). In addition, to ensure that the VOCs did not cumulatively exceed trigger levels, the average concentration for each VOC was divided by its respective trigger level to determine what fraction the concentration represented. The resulting fractions were then added for all VOCs that had at least one detection. If, collectively, the VOC concentrations had exceeded the trigger levels, the resulting value would be above 1.0 (i.e., the fractions would add up to over 1.0). As shown in Table 1, the value is not above 1.0 for Bldg. K-1225.

Based on the winter sampling event, the results and comparisons presented show that the vapor intrusion pathway is not complete beneath Bldg. K-1225, and, thus, there is no adverse impact to human health.

Table 1. Sub-slab soil vapor results for Building K-1225

Analyte	Frequency of detection	Minimum detected concentration	Maximum detected concentration	Arithmetic mean concentration	Trigger level[a]	Trigger level exceeded?	Arithmetic mean fraction of trigger level
Volatile organic compounds (µg/m³)							
1,1,1-Trichloroethane	4/5	2.00E-01	8.10E+01	1.66E+01	3.01E+05	No	5.51E-05
1,1,2,2-Tetrachloroethane	3/5	5.00E-02	2.00E+00	6.30E-01	6.67E+02	No	9.45E-04
1,1,2-Trichloro-1,2,2-trifluoroethane	3/5	5.00E-01	9.00E-01	5.60E-01	4.04E+06	No	1.39E-07
1,1,2-Trichloroethane	2/5	1.00E+00	3.00E+00	9.80E-01	1.91E+03	No	5.12E-04
1,1-Dichloroethane	0/5	ND[b]	ND	ND	6.88E+04	NA[c]	NA
1,1-Dichloroethene	1/5	8.00E-01	8.00E-01	3.20E-01	7.55E+02	No	4.24E-04
1,2-Dichloroethane	3/5	3.00E-01	5.00E+00	1.34E+00	1.43E+03	No	9.35E-04
1,2-Dichloroethene	1/5	1.00E+00	1.00E+00	3.60E-01	3.95E+03	No	9.10E-05
1,2-Dichloropropane	3/5	3.00E-01	7.00E-01	4.00E-01	5.45E+02	No	7.34E-04
2-Butanone	3/5	1.00E+00	5.00E+00	2.80E+00	6.84E+05	No	4.09E-06
2-Hexanone	1/5	9.00E-01	9.00E-01	3.38E+00	2.51E+04	No	1.34E-04
4-Methyl-2-pentanone	0/5	ND	ND	ND	4.06E+05	NA	NA
Acetone	4/5	4.00E+00	3.90E+01	1.52E+01	4.13E+05	No	3.68E-05
Benzene	5/5	1.00E+00	8.50E+01	2.58E+01	4.05E+03	No	6.37E-03
Bromodichloromethane	0/5	ND	ND	ND	2.62E+03	NA	NA
Bromoform	0/5	ND	ND	ND	1.39E+04	NA	NA
Bromomethane	0/5	ND	ND	ND	6.89E+02	NA	NA
Carbon disulfide	1/5	3.00E-01	3.00E-01	1.80E-01	9.31E+04	No	1.93E-06
Carbon tetrachloride	4/5	6.00E-01	3.77E+02	7.62E+01	3.35E+02	No	2.27E-01
Chlorobenzene	2/5	8.00E-02	7.00E-01	3.06E-01	2.75E+03	No	1.11E-04
Chloroethane	0/5	ND	ND	ND	1.38E+06	NA	NA
Chloroform	1/5	6.70E+01	6.70E+01	1.36E+01	1.62E+03	No	8.40E-03
Chloromethane	4/5	8.00E-01	3.00E+00	1.38E+00	1.24E+04	No	1.11E-04
Dibromochloromethane	1/5	2.00E-01	2.00E-01	4.00E-01	1.26E+04	No	3.17E-05
Ethylbenzene	4/5	6.00E-02	3.00E+00	9.12E-01	3.49E+04	No	2.61E-05
Methylene chloride	5/5	9.00E-01	1.20E+02	2.66E+01	7.92E+04	No	3.36E-04
Styrene	2/5	3.00E-01	2.00E+00	5.80E-01	1.38E+05	No	4.19E-06
Tetrachloroethene	4/5	3.00E-01	6.70E+01	1.38E+01	6.66E+04	No	2.07E-04
Toluene	5/5	2.00E-01	4.00E+01	1.38E+01	5.39E+04	No	2.57E-04
Total Xylene	3/5	1.00E+00	3.30E+01	1.01E+01	1.38E+04	No	7.28E-04
Trichloroethene	2/5	3.00E+00	7.80E+01	1.64E+01	5.45E+03	No	3.00E-03

Table 1. (continued)

Analyte	Frequency of detection	Minimum detected concentration	Maximum detected concentration	Arithmetic mean concentration	Trigger level[a]	Trigger level exceeded?	Arithmetic mean fraction of trigger level
Vinyl chloride	0/5	ND	ND	ND	4.23E+03	NA	NA
cis-1,2-Dichloroethene	1/5	9.00E-01	9.00E-01	3.40E-01	4.81E+03	No	7.06E-05
cis-1,3-Dichloropropene	0/5	ND	ND	ND	2.80E+03	NA	NA
trans-1,2-Dichloroethene	1/5	4.00E-01	4.00E-01	2.40E-01	9.67E+04	No	2.48E-06
trans-1,3-Dichloropropene	0/5	ND	ND	ND	4.91E+03	NA	NA
						Sum of fractions	2.51E-01

[a]Trigger level was developed with the Johnson-Ettinger (JE) model, assuming an indoor air preliminary remediation goal based on risk level of 1E-5 and hazard index of 0.1 for industrial exposure (250 d/year, 25 years).

[b]ND = non-detection.

[c]NA = not applicable; no detected concentrations.

3. REFERENCE

EPA (U. S. Environmental Protection Agency) 2002. *Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils*, EAP530-F-052, November.